CONTRIBUTIONS TO PALÆONTOLOGY

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TERTIARY MAMMALS FROM THE AURIFEROUS GRAVELS NEAR COLUMBIA, CALIFORNIA

By John C. Merriam and Chester Stock

With two text-figures

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INTRODUCTION

Since their earliest exploitation for gold, the auriferous gravels of the Sierra Nevada have yielded on occasion remains of fossil mammals whose age clearly indicates the presence of deposits belonging to several divisions of the Cenozoic. Extensive hydraulic and placer mining in this region is largely responsible for the fact that many localities where fossil materials have been found in the past are now no longer accessible.

In the course of mining operations by the Springfield Development Company, two horse teeth and a fragmentary camel jaw were found in gravels and sands of the Springfield shafts Nos. 2 and 3, located one and one-half miles southwest of Columbia, California. The mammalian remains were obtained by R. W. Chaney from J. S. Cademartori, Superintendent of the Springfield Development Company.

Since the stratigraphic occurrence of the material, as determined by Professor George D. Louderback, is definitely established with reference to the Tertiary section exposed in this region, interest attaches to the age and correlation of the deposits as suggested by the relationships of the fossil mammals. Moreover, the presence of fossil plants in the sedimentary series offers, among other features, an opportunity to check the age relationships of the accumulations by the application of paleobotanical evidence.

DESCRIPTION OF VERTEBRATE REMAINS

Hipparion, near mohavense Merriam

The two horse teeth available from the Springfield shaft Number 2, Univ. Calif. Coll. Loc. A 729, represent $P\underline{4}$ and $M\underline{3}$. The premolar, No. 24246 Univ. Calif. Coll. and the molar, No. 24247, were found some distance apart. In the light of the characters presented by these teeth there seems little reason for assuming that the specimens do not belong to the same species. Possibly two individuals are represented, differing slightly in age and size. These teeth resemble each other in the strongly developed external styles, in narrowness of the fossettes and complexity of their enamel borders, and in the flattened and somewhat elongate protocone.

Nos. 24246 and 24247 are smaller than comparable teeth of *Hipparion mohavense* from the Ricardo. They resemble, however, the latter in complexity of enamel borders of the fossettes. The protocone tends to flatten slightly, more so than in the typical *H. mohavense*. Likewise, in the more elongate character of this cusp, the teeth differ from the Ricardo type. However, the character of round-oval protocone seen in the type and associated teeth of *H. mohavense* is modified somewhat in the subspecies *H. mohavense callodonte*, described also by Merriam from the Ricardo. In the

characters in which *callodonte* differs from typical *mohavense* it approaches the specimens from Columbia.

In size Nos. 24246, 24247 resemble somewhat teeth of *Neohipparion gratum tehonense* described by Merriam from the Chanac formation of California. There is a more distinct tendency for the protocone to flatten in Nos. 24246, 24247 than in *N. gratum tehonense*. The fossettes may average slightly narrower than in teeth of *Neohipparion gratum* from the Snake Creek beds of Nebraska.

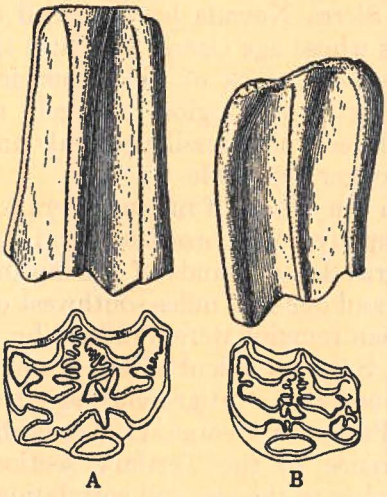

FIG. 1—*Hipparion*, near *mohavense* Merriam. A, P4, No. 24246; B, M3, No. 24247; lateral and occlusal views; x 1. University of California Collections. Auriferous sands and gravels, near Columbia, California.

A single tooth described from the Siestan Pliocene of the Berkeley Hills, California,[1] No. 24241 Univ. Calif. Coll., and referred to *Hipparion*, near *mohavense*, shows considerable resemblance to the horse from the auriferous gravels. No. 24246 is slightly smaller than No. 24241, but similarity between the two teeth prevails in shape of protocone and in the degree of plication of the fossette borders. The plications seem to be essentially the same in both forms, but are slightly more numerous in No. 24246. While the pli caballin is single in the premolar, it is double in the third upper molar, No. 24247. In the Siestan tooth this structure is double with a small spur extending forward from the anterior plication.

Of the several specimens with which comparisons have been made, No. 24241 appears to resemble most closely the species recorded from near Columbia. Both Nos. 24241 and 24246, while not identical in character with teeth of typical *Hipparion mohavense*, resemble specimens belonging to this group of horses.

Measurements of teeth (in millimeters)

	P4 No. 24246	M No. 24247
Greatest anteroposterior diameter	21.9	19
Transverse diameter across protocone and mesostyle	19.5	14
Anteroposterior diameter of protocone	6.8	6

[1] C. Stock, Univ. Calif. Publ. Bull. Dept. Geol. Sci., vol. 13, 19–21, 1 fig., 1921.

Camelid, possibly Pliauchenia or Procamelus

Unfortunately the ramus of the mandible, No. 24248, is too fragmentary to give much information. The premolars and apparently the anterior molar have been broken away. The posterior molars are only partly preserved. This specimen came from shaft 3 (Richards shaft).

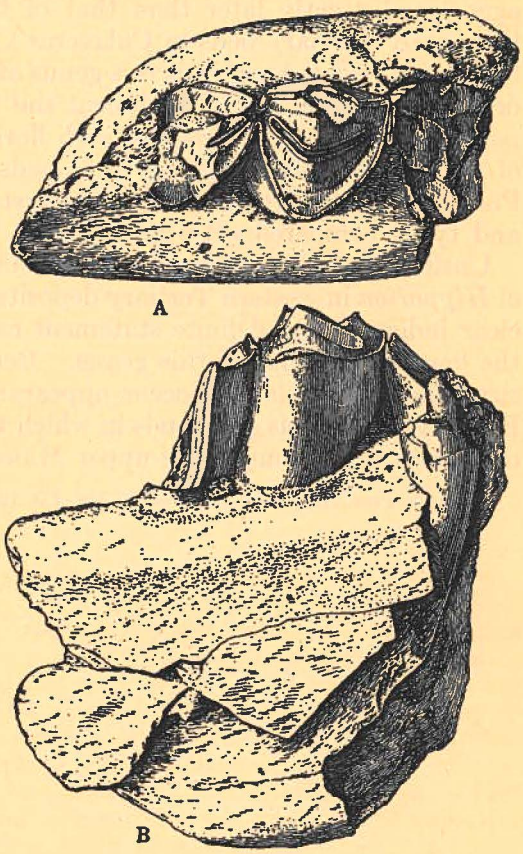

FIG. 2—Camelid, possibly *Pliauchenia* or *Procamelus*. A, B, fragment of jaw and lower dentition, No. 24248, dorsal and lateral views; x 1. Mass shown on upper side of figure 2A represents rock matrix. University of California Collections. Auriferous sands and gravels, near Columbia, California.

The specimen is larger than camel material referred to *Procamelus*, near *gracilis* from the Cedar Mountain upper Miocene, Nevada. This is shown by the size of the ramus and the individual teeth. It is larger also than some of the materials referred tentatively to *Procamelus* or *Alticamelus* from the Ricardo lower Pliocene of the Mohave Desert.

AGE RELATIONSHIPS

The scattered vertebrate remains which have been found in the auriferous gravels and associated deposits of the Sierra Nevada, although for the most part fragmentary and incomplete, are suggestive of faunal stages ranging in age from late Oligocene or early Miocene to the Pleistocene.

Whatever age relationships are indicated by the mammalian remains from the gravels and sands exposed in the Springfield mine shafts near Columbia, the most direct evidence is that afforded by the horse teeth. The genus *Hipparion* representing this material is found elsewhere in western North America associated with faunas whose ages are distinctly later than that of the faunal elements recorded from early Tertiary beds in Calaveras County.[1] Moreover, nowhere in western North America is this genus of horse recorded in Pleistocene deposits. In stage of development the two teeth represent the *Hipparion* group as it is known in such horizons as the Ricardo deposits of the Mojave Desert region, three beds having been classed with the Pliocene. A close relationship is suggested with *Hipparion mohavense* and types compared with the latter.

Until cumulative information regarding the stratigraphic position of *Hipparion* in western Tertiary deposits is of such extent as to permit clear judgment, no definite statement can be made with reference to the lower time range of this genus. Recent discussions have emphasized the possible late Miocene appearance of *Hipparion* in America. Possibly the gravels and sands in which the horse teeth and camel jaw occurred near Columbia are upper Miocene in age.

[1] C. Stock, Proc. Nat. Acad. Sci., vol. 18, 552–553, 1932.